Gaël M. ROUDIER

Jet Propulsion Laboratory
Mail Stop 169-327
4800 Oak Grove Drive
91109 PASADENA – CA

E-mail: Gael.M.Roudier@jpl.nasa.gov
Office phone: (818) 393 7252

Citizenship – French

Education

2008 – 2011: PhD in Cosmology, "AstroParticule & Cosmologie" APC laboratory,
Université Paris Diderot – Paris7.
Thesis Title : **Cosmic birefringence constraints from Planck Cosmic Microwave Background polarized data analysis.***

* The thesis is under seal of confidentiality until 2015 according to the Planck data policy.

2006 – 2008: Master Universe Science and Spatial Technologies,
L'Observatoire de Paris.

2001 – 2004: Ecole Nationale Supérieure d'Ingénieurs de Caen (ENSICaen),
Ionizing rays instrumentation.

1998 – 2001: Classe Préparatoire aux Grandes Ecoles (CPGE),
Concours Commun Polytechnique.

Professional experience

November 2015 – present : **JPL Scientist (ongoing)**

- NASA Jet Propulsion Laboratory

November 2012 – present : **Post Doctoral researcher**

- NASA Jet Propulsion Laboratory / Caltech
- Advisors : Charles LAWRENCE & Brendan CRILL

I am responsible for the High Frequency Instrument (HFI) scanning beam recovery products, as well as the bolometers' time constants products for HFI Planck 2013 and 2014, 2015 released products. The changes I introduced after my initial work in 2013 are vowed to bring the beam window function systematics down to the level required for polarized science.
I coordinated the efforts on the systematics error budget retrieval related to the beam characterization, and provided the inputs for the Planck optical system geometry recovery from flight data.
I then extended this framework to the HFI constraints on the birefringence angle, tracer of exotic physics as extensions of the Standard Model, also used as a tracer of polarized spectra wealthiness.

In parallel, I am involved in the Exoplanet Science Data analysis Pipeline (Mark SWAIN & al.), where I lead the production of transmission spectra from Hubble Space Telescope exoplanet light curve analysis; using a Monte Carlo Markov Chain approach that handles the recovery of the light curve transit parameters simultaneously with the instrumental errors signatures.

November 2011 – November 2012 : **Post Doctoral researcher**

- L'Observatoire de Paris, LERMA
- Advisor : Jean-Michel LAMARRE

I produced the bolometer temporal transfer functions for the first cosmological public results of Planck HFI data and created a new representation of Planck HFI beams, taking down the bias of the corrective instrumental window function in the highest frequency bands by one order of magnitude. Those bands are critical in the foreground cleaning process.
I initiated the Monte Carlo simulations efforts in order to characterize the error budget on the beam window function.
I was also involved in the “Fundamental Physics with Planck” and the “Cosmology with Planck data alone” working groups. My contribution in these last teams is the constraint of the cosmic birefringence angle from polarized spectra.

April – July 2008 : **Final year master degree project**

- Laboratoire AstroParticule et Cosmologie (APC), Cosmologie & Gravitation.
- Subject : "*Planck High Frequency Instrument Beams reconstruction from in flight data."*

I produced an original method for the the beam recovery using the main brightest planets and ultra compact HII regions data. Results were presented during a HFI Coreteam meeting.

March – September 2004 : **Final year engineer project**

- CEA Saclay : DEpartement des TEchnologies du Capteur et du Signal (DETECS).
- Subject : *Experimental study of an actinide differentiation with photon interrogation and spectrometry of photo-fission delayed gammas.*

Skills

Computing skills

Programming Languages: IDL, Python, Matlab

Teaching skills

Regularly supervised practicals for undergraduate students and supervised the final project of a first year master student during my PhD.

Advisors

2012 – 2015

Charles LAWRENCE
PLANCK Science Team Member
PLANCK LFI Survey Scientist
Relativistic Astrophysics
Jet Propulsion Laboratory
charles.r.lawrence@jpl.nasa.gov

Brendan CRILL
HFI Working Group Leader
Astronomical Instrumentation
Jet Propulsion Laboratory
Brendan.P.Crill@jpl.nasa.gov

2011 – 2012

Jean-Michel LAMARRE
PLANCK Science Team Member
PLANCK HFI Instrument Scientist
L'Observatoire de Paris LERMA
jean-michel.lamarre@obspm.fr

2008 – 2011

Ken M. GANGA
HFI Working Group Leader, PhD supervisor
Groupe Cosmologie et Gravitation
APC, Université Paris Diderot
ganga@apc.univ-paris7.fr

Guillaume PATANCHON
PhD co-supervisor
Groupe Cosmologie et Gravitation
APC, Université Paris Diderot
patanchon@apc.univ-paris7.fr

Conferences and meetings

Jan 2015

Planck HFI Restricted Coreteam meeting, reported results on the temporal transfer function and spurious dipole harmonics power.

July 2014

Planck HFI/LFI Joint Coreteam meeting, presented 2014 temporal parameters for 353 GHz channels.

May 2014

Planck HFI/LFI Joint Coreteam meeting, reported methodology for future temporal transfer functions.

February 2014

Planck HFI Coreteam meeting, presented R&D on temporal transfer functions.

November 2013

Planck HFI Coreteam meeting, presented beam products.

June 2013

Planck HFI Coreteam meeting, presented major updates on the beam pipeline.

May 2013

UC Davis Cosmic Frontiers Conferences, presented poster on HFI transfer functions.

April 2013

Planck HFI Coreteam meeting, presented R&D on beams and time constants retrieval.

April 2013

47th ESLAB Symposium, The Universe as seen by Planck.

March 2012

ESTEC Planck Science Team technical meeting, presented reconstructed beams versus optical simulations.

March 2012

Planck HFI Coreteam meeting, presented beam Monte Carlo simulation pipeline results.

January 2012

Planck HFI Coreteam meeting, presented new method for bolometer's time response recovery.

July 2011

Planck HFI Coreteam meeting, presented birefringence angle constraints with Planck.

January 2011

Planck HFI Coreteam meeting, presented new representation for HFI beams.

May 2010

Planck HFI Coreteam meeting, presented focal plane reconstruction and reverse engineering for telescope alignment retrieval results.

July 2009

ISAPP2009 - International School of Antiparticle Physics CMB and Fundamental Interaction Physics, presented poster.

May 2009

Planck Joint Coreteam meeting, presented first results of Mars response, highlighting temporal transfer function and beam degeneracy.

May 2008

Planck Joint Coreteam meeting, presented original beam reconstruction method based on stacked data from planets and HII ultra compact regions (final year undergraduate project).

Chosen main publications (4)

- **Planck HFI beam reconstruction**
  *(**G. Roudier**, B. Crill, A. Ducout, E. Hivon, S. Mottet, A. Coulais & the Planck collaboration)*
  36th ESA Antenna workshop, October 2015
- **Planck 2015 results. VII. HFI TOI and beam processing**
  Planck collaboration
  Accepted A&A, 2015
- **Planck 2013 results. VII. HFI time response and beams**
  Planck collaboration
  A&AVolume 571, November 2014
- **Planck 2013 results. VI. High Frequency Instrument data processing**
  Planck collaboration
  A&AVolume 571, November 2014

Publications (86)

Cosmic Microwave Background (Origin of the Universe) : 85
Cosmic Infrared Background (Early Universe) : 1

2015 (41)

1. Planck 2015 results. III. LFI systematic uncertainties
2. Planck 2015 results. XI. CMB power spectra, likelihoods, and robustness of parameters
3. Planck 2015 results. XXVI. The Second Planck Catalogue of Compact Sources
4. Planck 2015 results. XVI. Isotropy and statistics of the CMB
5. Planck 2015 results. XXV. Diffuse low-frequency Galactic foregrounds
6. Planck 2015 results. V. LFI calibration
7. Planck intermediate results. XXXVIII. E- and B-modes of dust polarization from the magnetized filamentary structure of the interstellar medium
8. Planck Intermediate Results. XXXVI. Optical identification and redshifts of Planck SZ sources with telescopes in the Canary Islands Observatories
9. Planck intermediate results. XXXVII. Evidence of unbound gas from the kinetic Sunyaev-Zeldovich effect
10. Planck intermediate results. XXVII. High-redshift infrared galaxy overdensity candidates and lensed sources discovered by Planck and confirmed by Herschel-SPIRE
11. Planck 2015 results. IX. Diffuse component separation: CMB maps
12. Planck intermediate results. XXXV. Probing the role of the magnetic field in the formation of structure in molecular clouds
13. Planck 2015 results. XX. Constraints on inflation
14. Planck 2015 results. XXVIII. The Planck Catalogue of Galactic Cold Clumps
15. Planck 2015 results. XXVII. The Second Planck Catalogue of Sunyaev-Zeldovich Sources
16. Planck 2015 results. XXVII. The Second Planck Catalogue of Sunyaev-Zeldovich Sources
17. Planck 2015 results. XXIV. Cosmology from Sunyaev-Zeldovich cluster counts
18. Planck 2015 results. XXII. A map of the thermal Sunyaev-Zeldovich effect
19. Planck 2015 results. XXI. The integrated Sachs-Wolfe effect
20. Planck 2015 results. XIX. Constraints on primordial magnetic fields
21. Planck 2015 results. XVIII. Background geometry & topology
22. Planck 2015 results. XVII. Constraints on primordial non-Gaussianity
23. Planck 2015 results. XV. Gravitational lensing
24. Planck 2015 results. XIV. Dark energy and modified gravity
25. Planck 2015 results. XIII. Cosmological parameters
26. Planck 2015 results. X. Diffuse component separation: Foreground maps
27. Planck 2015 results. VIII. High Frequency Instrument data processing: Calibration and maps
28. Planck 2015 results. VII. HFI TOI and beam processing

    Accepted A&A
29. Planck 2015 results. VI. LFI mapmaking
30. Planck 2015 results. IV. Low Frequency Instrument beams and window functions
31. Planck 2015 results. II. Low Frequency Instrument data processing
32. Planck 2015 results. I. Overview of products and scientific results
33. A Joint Analysis of BICEP2/Keck Array and Planck Data
34. Planck 2013 results. XXIX. The Planck catalogue of Sunyaev-Zeldovich sources: Addendum

35. Planck intermediate results. XXXIV. The magnetic field structure in the Rosette Nebula
36. The Magnetic Fields at the Surface of Active Single G-K Giants
37. Planck intermediate results. XXXIII. Signature of the magnetic field geometry of interstellar filaments in dust polarization maps
38. On the Origin of Near-Infrared Extragalactic Background Light Anisotropy
Science Vol. 346 no. 6210 pp. 732-735
39. Planck intermediate results. XXXII. The relative orientation between the magnetic field and structures traced by interstellar dust
40. Planck intermediate results. XXXI. Microwave survey of Galactic supernova remnants
41. Planck intermediate results. XXX. The angular power spectrum of polarized dust emission at intermediate and high Galactic latitudes

2014 (11)

42. Planck intermediate results. XXVIII. Interstellar gas and dust in the Chamaeleon clouds as seen by Fermi LAT and Planck
43. Planck intermediate results. XXIX. All-sky dust modeling with Planck, IRAS, and WISE observations
44. Planck intermediate results. XXVI. Optical identification and redshifts of Planck clusters with the RTT150 telescope
45. Planck intermediate results. XXV. The Andromeda Galaxy as seen by Planck
46. Planck intermediate results. XXIV. Constraints on variation of fundamental constants
47. Planck intermediate results. XXIII. Galactic plane emission components derived from Planck with ancillary data
48. Planck intermediate results. XXII. Frequency dependence of thermal emission from Galactic dust in intensity and polarization
49. Planck intermediate results. XXI. Comparison of polarized thermal emission from Galactic dust at 353 GHz with optical interstellar polarization
50. Planck intermediate results. XX. Comparison of polarized thermal emission from Galactic dust with simulations of MHD turbulence
51. Planck intermediate results. XIX. An overview of the polarized thermal emission from Galactic dust
52. Planck intermediate results. XVIII The millimeter and sub-millimeter emission from planetary nebulae

2013 (32)

53. Planck intermediate results. XVII. Emission of dust in the diffuse interstellar medium from the far-infrared to microwave frequencies
54. Planck 2013 results. XI. All-sky model of thermal dust emission
55. Planck intermediate results. XVI. Profile likelihoods for cosmological parameters
56. Planck intermediate results. XV. A study of anomalous microwave emission in Galactic clouds
57. Planck 2013 results. XXX. Cosmic infrared background measurements and implications for star formation
58. Planck 2013 results. XXIX. Planck catalogue of Sunyaev-Zeldovich sources
59. Planck 2013 results. XXVIII. The Planck Catalogue of Compact Sources
60. Planck 2013 results. XXVI. Background geometry and topology of the Universe
61. Planck 2013 results. XXV. Searches for cosmic strings and other topological defects
62. Planck 2013 Results. XXIV. Constraints on primordial non-Gaussianity

63. Planck 2013 results. XXIII. Isotropy and Statistics of the CMB
64. Planck 2013 results. XXII. Constraints on inflation
65. Planck 2013 results. XXI. Cosmology with the all-sky Planck Compton parameter y-map
66. Planck 2013 results. XX. Cosmology from Sunyaev-Zeldovich cluster counts
67. Planck 2013 results. XIX. The integrated Sachs-Wolfe effect
68. Planck 2013 results. XVIII. Gravitational lensing-infrared background correlation
69. Planck 2013 results. XVII. Gravitational lensing by large-scale structure
70. Planck 2013 results. XVI. Cosmological parameters
71. Planck 2013 results. XV. CMB power spectra and likelihood
72. Planck 2013 results. XIV. Zodiacal emission
73. Planck 2013 results. XIII. Galactic CO emission
74. Planck 2013 results. XII. Component separation
75. Planck 2013 results X. Energetic particle effects: characterization, removal, and simulation
76. Planck 2013 results. IX. HFI spectral response
77. Planck 2013 results. VIII. HFI photometric calibration and mapmaking
78. Planck 2013 results. VII. HFI time response and beams

    A&AVolume 571, November 2014
79. Planck 2013 results. VI. High Frequency Instrument data processing

    A&AVolume 571, November 2014
80. Planck 2013 results. V. LFI calibration
81. Planck 2013 results. IV. Low Frequency Instrument beams and window functions
82. Planck 2013 results. III. LFI systematic uncertainties
83. Planck 2013 results. II. The Low Frequency Instrument data processing
84. Planck 2013 results. I. Overview of products and scientific results

2011 (2)

85. Planck early results. VI. The High Frequency Instrument data processing

    A&A Volume 536, December 2011
86. Planck early results: first assessment of the High Frequency Instrument in-flight performance

    A&A Volume 536, December 2011